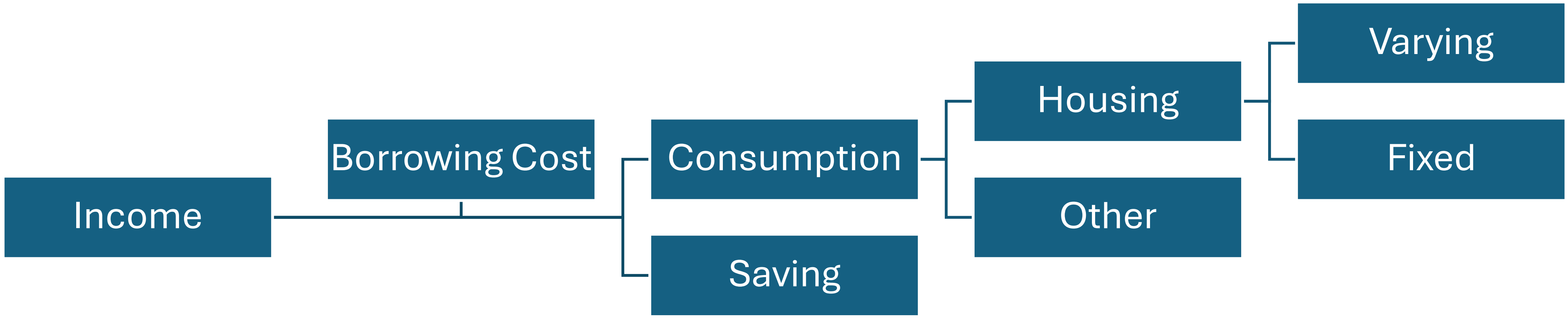
Impact of Borrowing Cost on Lifecycle Consumption and Saving

across Different Income Levels under Varying and Fixed Housing Conditions

- Introduction
- Models
- Results
- Conclusions
- Limitations

Introduction

Introduction



Goals

1. Do high and low-income groups share the same consumption and saving patterns?
2. Does the borrowing cost change these patterns?
3. Does varying or fixed housing change these patterns?
4. In what way?

We have learnt:

- Cobb–Douglas function as a utility function
- The Multiperiod Fisher Optimal Consumption Model
  - Random incomes
  - Consumption with / without borrowing cost

We want to see:

Consumption and saving patterns with or without borrowing cost:

- Income changes across lifetime for an individual

- Income differs between individuals

- Consumption of two goods
  - Other goods
  - Housing

- One fixed good and one varying good
  - Other goods vary
  - Fixed Housing

Models

Model 1 – Base Case

Utility function U(x)

Income constraint
- No Borrowing Cost :
- Borrowing Cost :

Intertemporal constraint
- No Borrowing Cost :
- Borrowing Cost :

Model 2 – Varying Housing

Utility function U(c, h)

Income constraint

- No Borrowing Cost :
- Borrowing Cost :

Intertemporal constraint

- No Borrowing Cost :
- Borrowing Cost :

Model 3 – Fixed Housing

Utility function U(c, h)

Income constraint

- No Borrowing Cost :
- Borrowing Cost :

Intertemporal constraint

- No Borrowing Cost :
- Borrowing Cost :

Parameters

Interest Rates : r = 0.02 for 60 periods

Time Preference : q = 0.02

Curvature : e = 0.01

Penalty : penalty = 0.05

Periods 60

- Growth : 20 ± 5; Quadratic Growth
- Peak : 20 ∓ 5; Constant at Peak
- Pension : 20; Immediate Drop to Pension

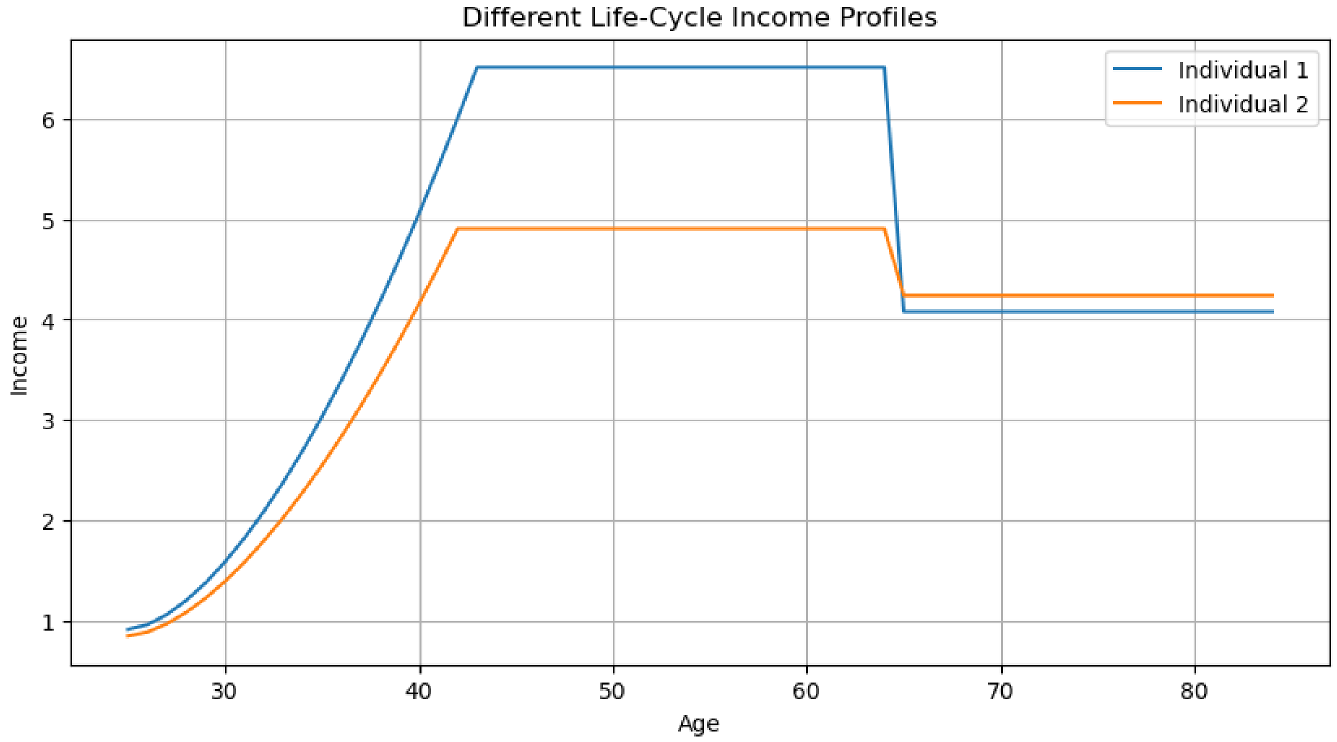
Optimizers

Two paths of optimization using *scipy.optimize* :

1. Nelder-Mead + BFGS
   - Used in 5 of the 6 scenarios
2. L-BFGS-B

Results

Life-Cycle Income Profiles



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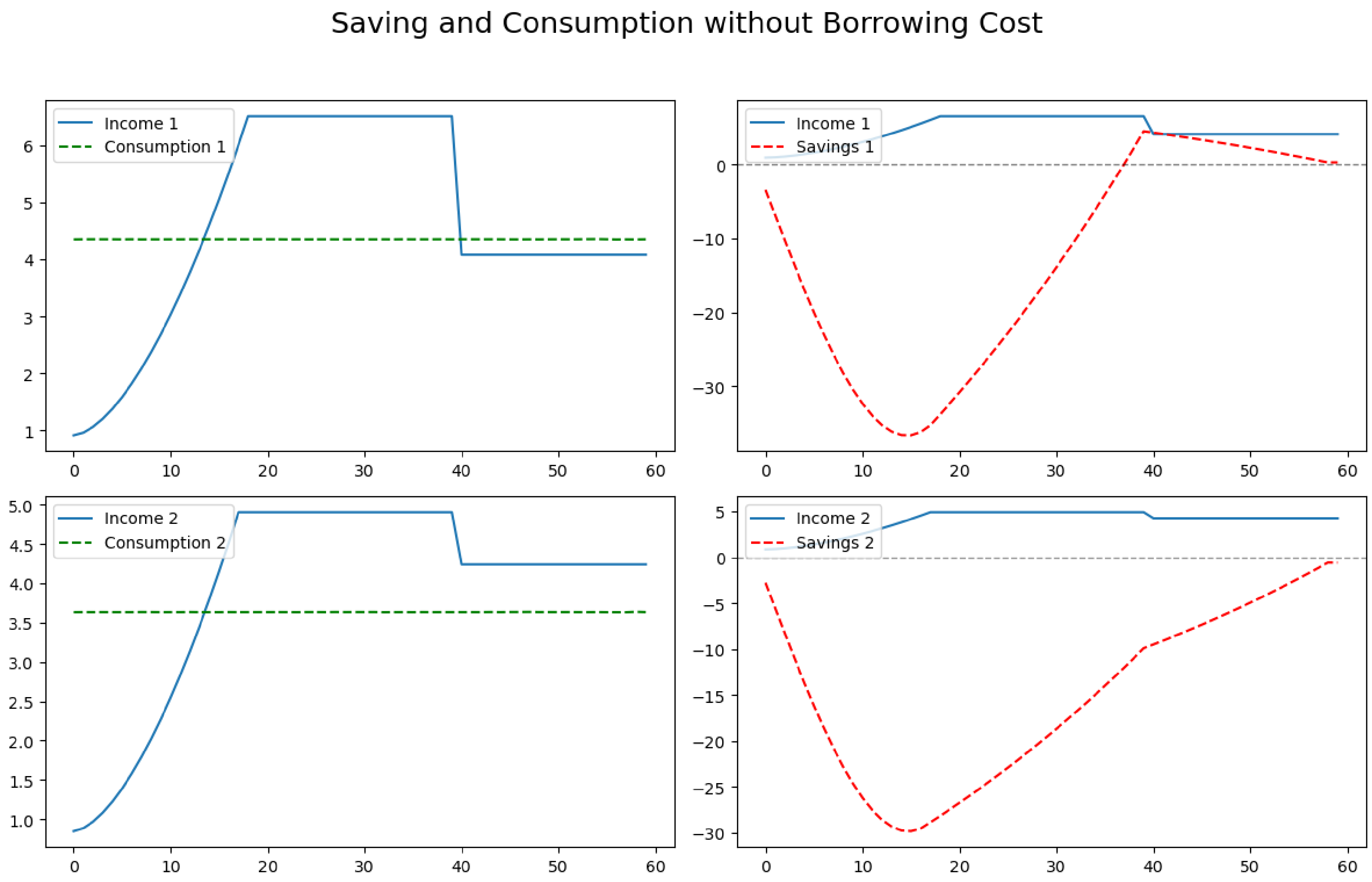

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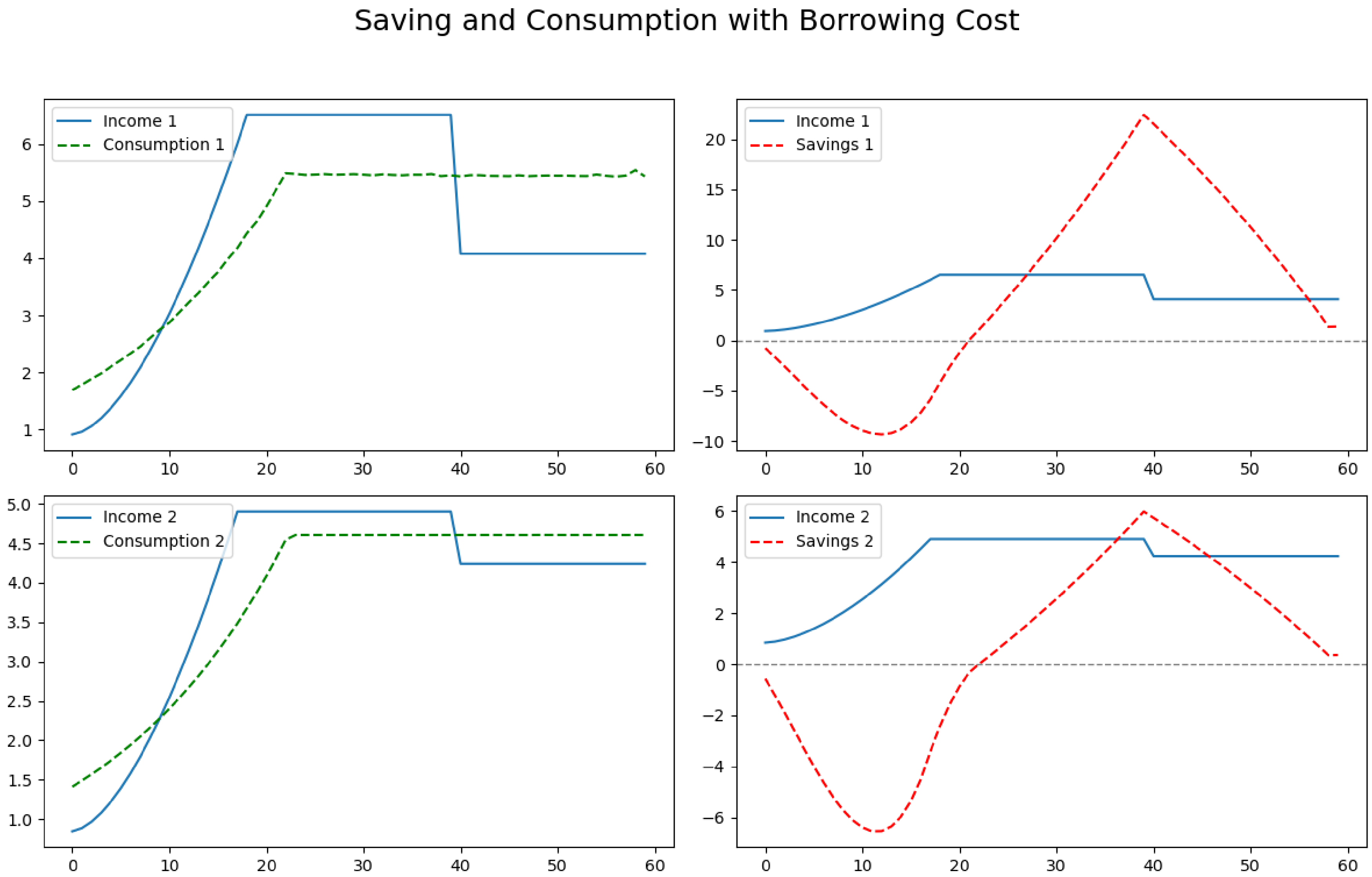
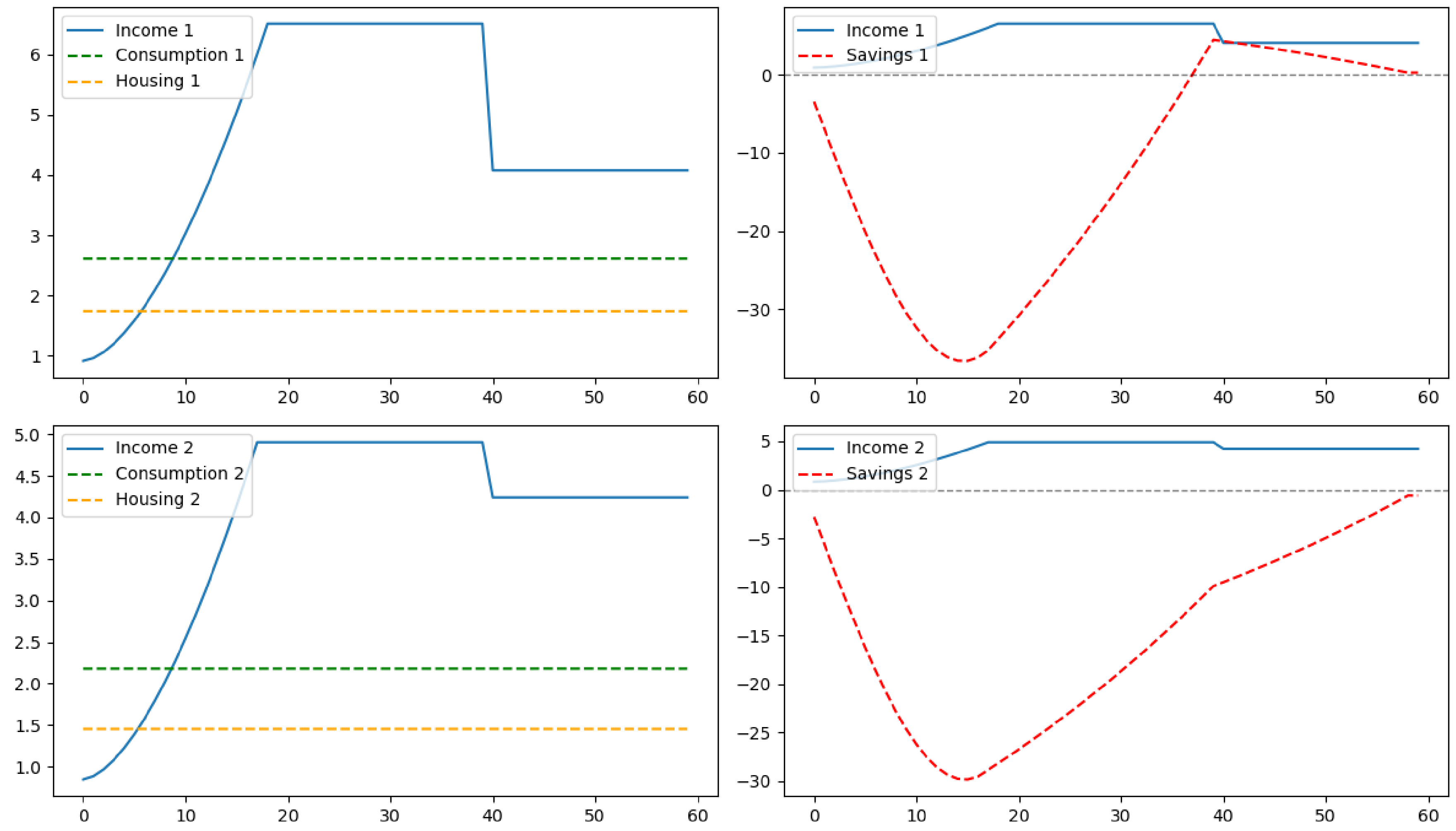


Model 2 – Varying Housing

Renter's Consumption of Varying Housing and Other Goods without Borrowing Cost



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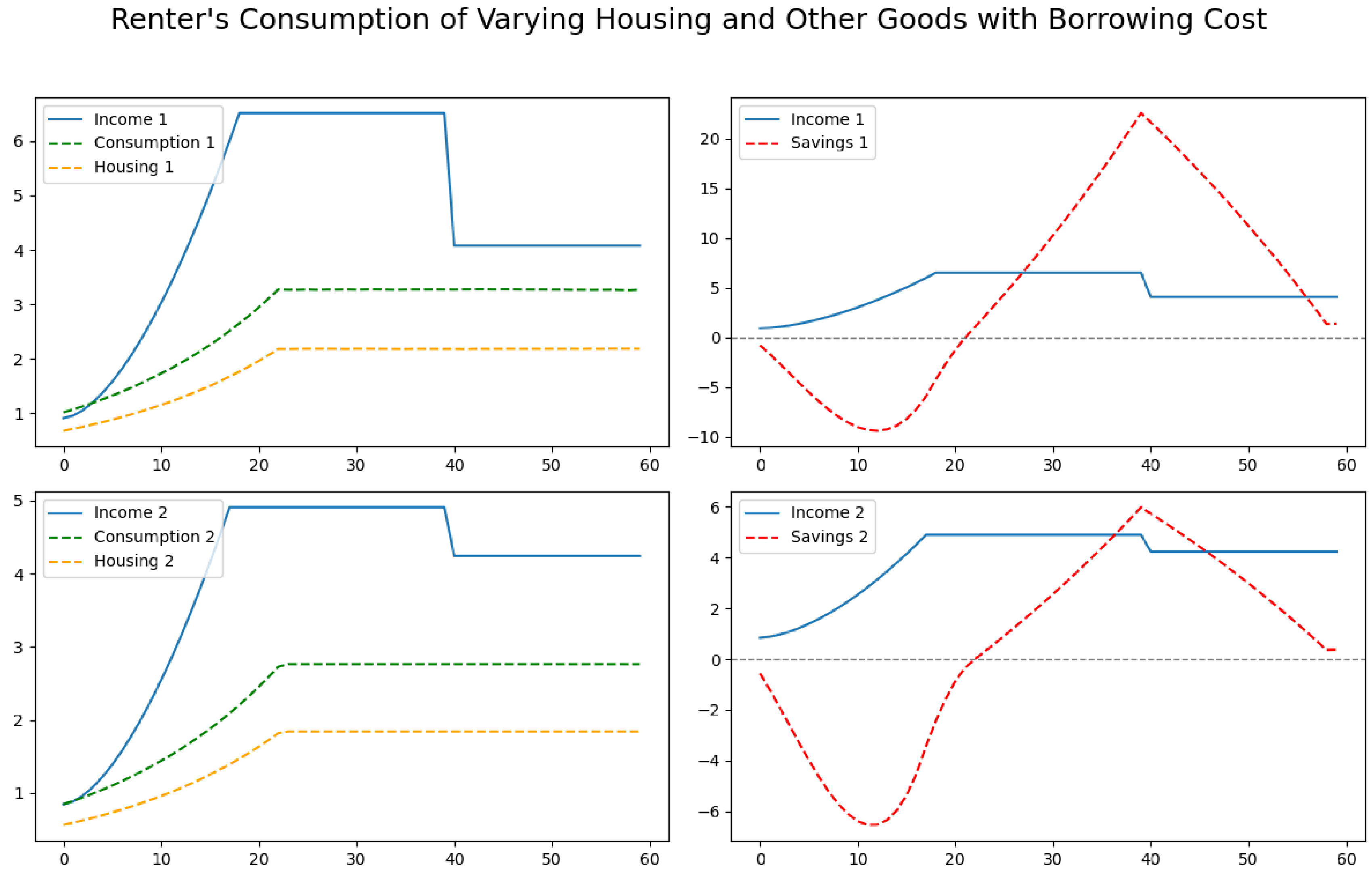
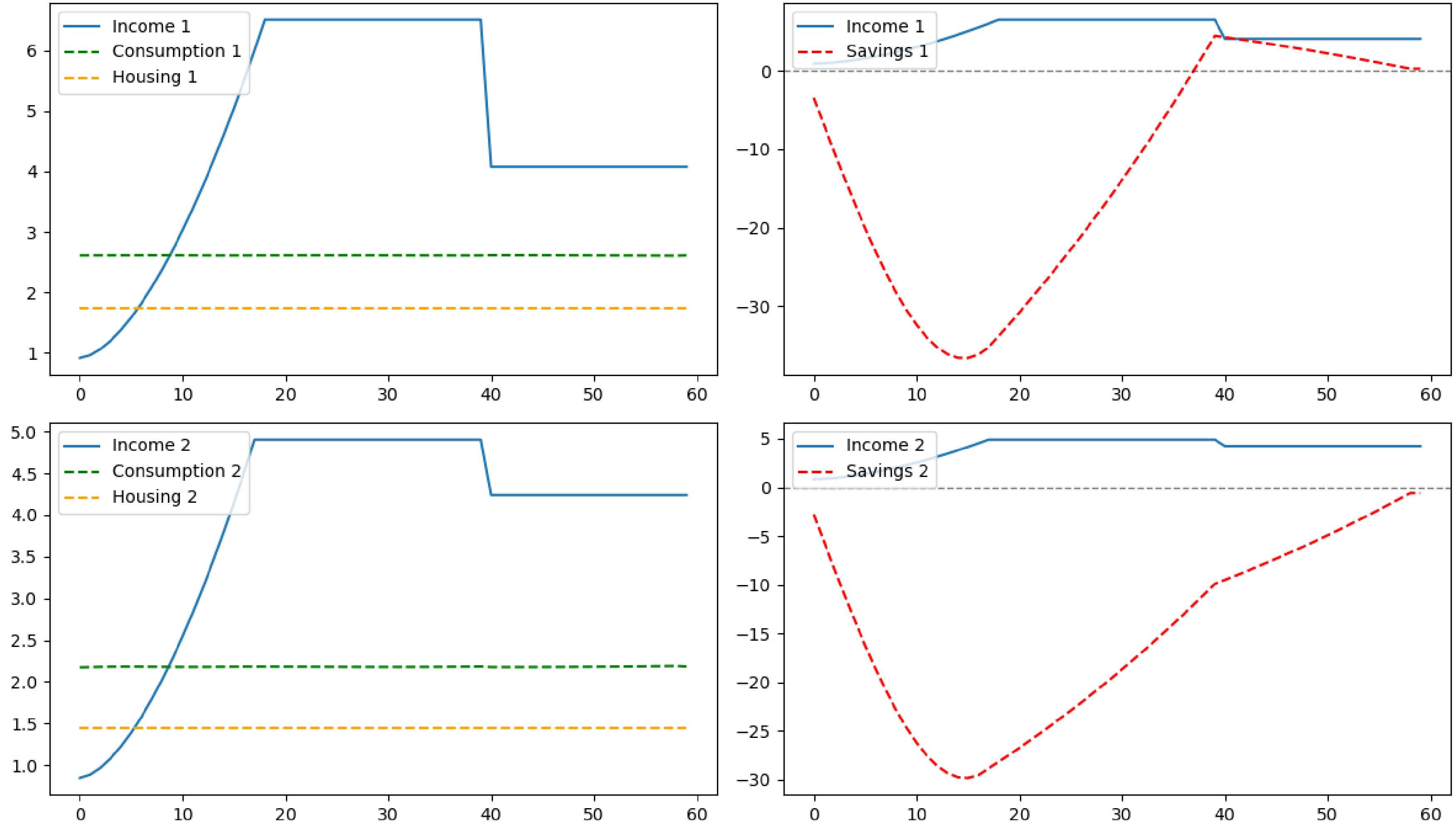


Model 3 – Fixed Housing

Homeowners' Consumption of Other Goods with Fixed Housing without Borrowing Cost



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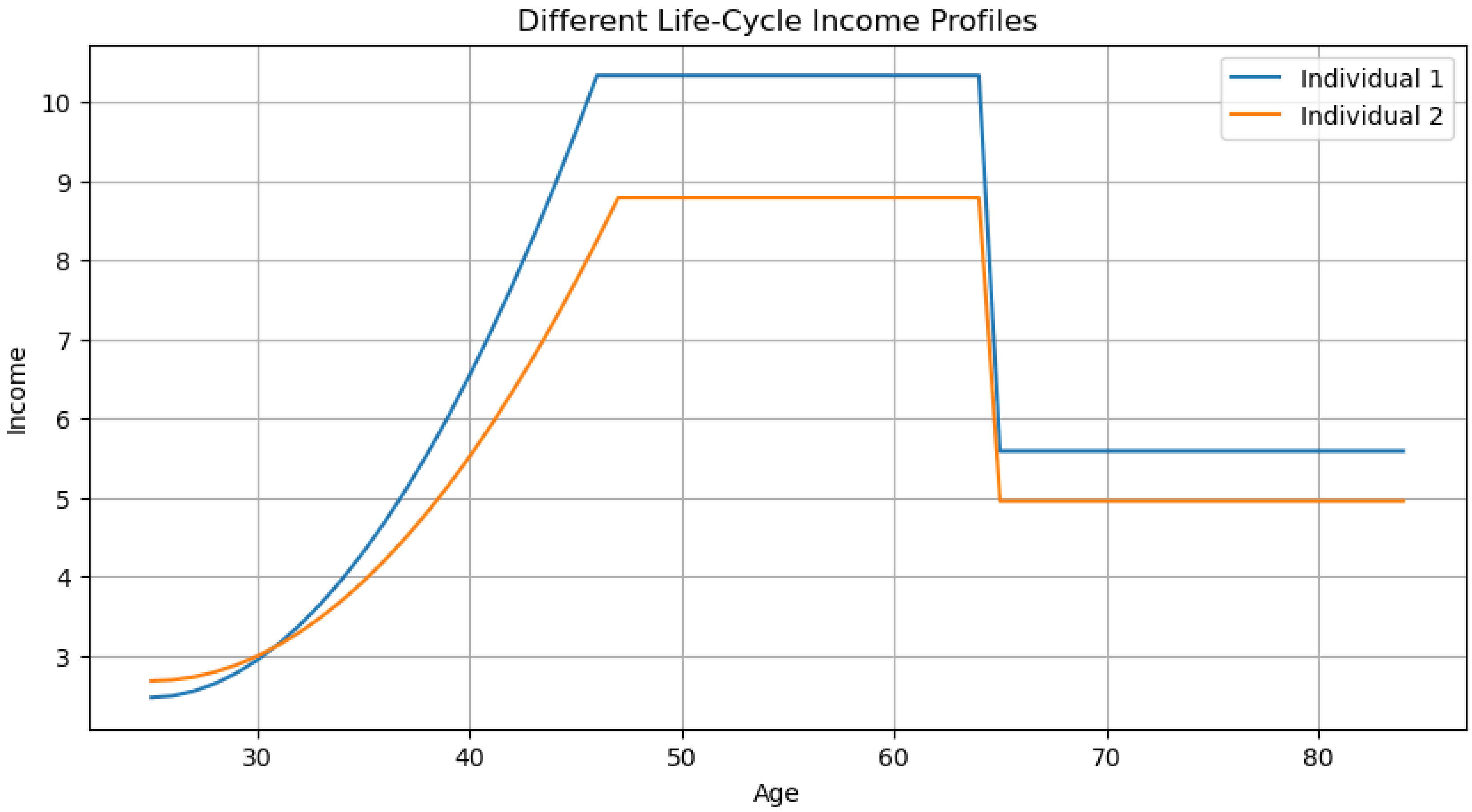

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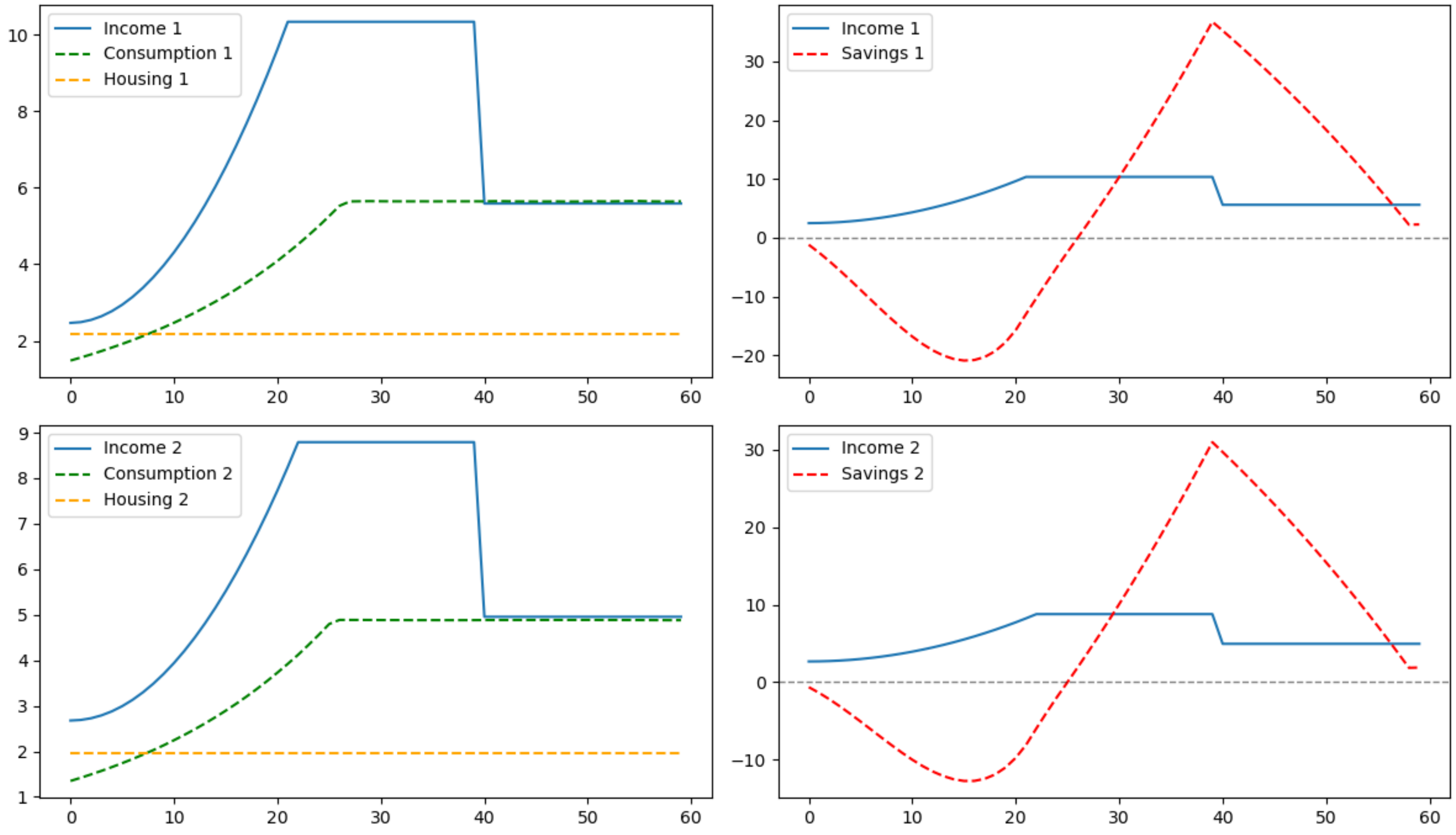

Conclusions

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With Borrowing Cost

- Smooth consumption

Without Borrowing Cost

- Irregular consumption

Conclusions

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1. Various incomes change levels of utility, goods consumed, and savings but not patterns with or without borrowing cost
2. Number of goods doesn’t affect patterns
3. Without borrowing cost, consumption and housing of renters and those of homeowners converge
4. Inversed preference with fixed housing and borrowing cost

Conclusions - Consumption and Housing

- stable consumption and housing levels across working life
- low initial income - borrowing heavily to smooth their consumption
- income rises - gradually repaying their debts
- Retirement
  - High-income consumers
    - achieve positive savings before retirement
    - savings decline as their income drops to the pension level
  - Low-income consumers
    - be able to pay off their debts by retirement
    - continue to repay their debts at a slower pace until the end

Conclusions

Without Borrowing Cost

- stable consumption and housing levels across working life
- low initial income - borrowing heavily to smooth their consumption
- income rises - gradually repaying their debts
- Retirement
  - High-income consumers
    - achieve positive savings before retirement
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Conclusions

With Borrowing Cost

- start with significantly lower levels of consumption and housing
- low initial income - discouraged from borrowing heavily due to penalty
- income rises - consumption and housing gradually increase and reach a peak when debts are fully repaid and remain constant
- High-income and Low-income consumers
    - Paid off debts much earlier
    - Savings peak by retirement
    - savings decline as their income drops to the pension level
- Homeowners
    - Initial consumption < Initial housing

Conclusions

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Limitations and Future Improvements

Limitations